

Date: Thursday, 04/01/2007 11:07:12 AM  
User: Linda Lacelle

# Process Sheet

Customer : CU-DAR001 Dart Helicopters Services Drawing Name : BAR  
Job Number : 30146  
Estimate Number : 10386  
P.O. Number : *N/A*  
This Issue : 04/01/2007 S.O. No. : *N/A*  
Prsht Rev. : NC  
First Issue : *N/A* Type : MACHINED PARTS  
Previous Run : 29120  
Written By :  
Checked & Approved By :  
Comment : Est Rev: A New Issue 05-11-08 JLM

Part Number : D31961  
Drawing Number : D3196 *UNDER REVIEW*  
Project Number : N/A  
Drawing Revision : U/R  
Material : *N/A*  
Due Date : 20/01/2007 Qty: 10 Um: Each

*OK* *07.01.04*

## Additional Product

Job Number:



Seq. #: Machine Or Operation: Description :

1.0 M6061T6B0750X01500 6061-T6 Bar .75" X 1.5"



Comment: Qty.: 2.2922 f(s)/Unit Total: 22.9215 f(s)

Material: 6061-T6/T651 (QQ-A-200/8) or (QQ-A-225/8)

(M6061T6B0.750x01.500)

Identify for D3196-1

Batch: *M103156*

*M102508 (1 blank)*  
*M18571 (1 blank) \* about 30" left, 26 1/4 cut + rest gauge)*  
*SD 07.01.18*

2.0 BAND SAW BAND SAW



Comment: BAND SAW

Cut blank: (0.75" x 1.50") x 26.200" long Bar

*SD/ 07.01.18 10*

3.0 HAAS1 HAAS CNC VERTICAL MACHINING #1



Comment: HAAS CNC VERTICAL MACHINING #1

1-Machine D3196-1 as per Folio FA339 and Dwg D3196 Identify as D3196-1

2-Deburr

*OH*  
*En 07.01.19 (x10)*

4.0 QC2 INSPECT PARTS AS THEY COME OFF MACHINE



Comment: INSPECT PARTS AS THEY COME OFF MACHINE

*En 07.01.19 (x10)*

5.0 QC8 SECOND CHECK



Comment: SECOND CHECK

*J.F. 07/01/19 X10*

W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Mfg / Design- Mgr	Approval QC Inspector	

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Design Mgr	Approval QC Inspector
			Initial Design Mgr	Action Description Design Mgr	Sign & Date			
07/01/18	3.0	are part scrap Program wasn't changed for the second OPN AND Dim. 1.100" is used sized for part by 0.012" and changed by 1.00"	QSI 042 07/01/18 per QSI 042	Program was changed by JLM. <del>Scrap/Scrap</del> and replace. 3.495 dim OK at 3.503±0.010 STRESS OK BECAUSE THIS WAS REPAIRS SAME DIM AS REV B OF DWG.	Ca 07/01/19	07/01/18	QSI 042 07/01/18	07/01/18
07/01/19	3	Length of "pad" at holes is 0.997" instead of 1.100"	QSI 042 07/01/19 per QSI 042	PART OK, MARGIN OF SAFETY OF STRESS REPORT UNAFFECTED.	Ca 07/01/19	07/01/23	QSI 042 07/01/19 per QSI 042	07/01/23

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes ☐ No ☒ DQA: ☒ Date: 07/01/24

NOTE: Date & initial all entries QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

Date: Thursday, 04/01/2007 11:07:12 AM  
User: Linda Lacelle

## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: BAR

Job Number: 30146

Part Number: D31961

Job Number:



Seq. #:

Machine Or Operation:

Description :

6.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1

25/1/07  
Q.M.

07-01-22  
07/01/19

(10)

(10X)

7.0

POWDER COATING

POWDER COATING



Comment: POWDER COATING

Powder Coat Grey Sandtex (Ref: 4.3.5.6) as per QSI 005 4.3

M101601

yl

07/01/22 X10

8.0

QC3

INSPECT POWDER COAT/CHEMICAL CONVERSION



Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

07/01/22

(10)

9.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: PACKAGING RESOURCE #1

Identify and Stock

Location: \_\_\_\_\_

57136

07/01/23

(10)

10.0

QC21

FINAL INSPECTION/W/O RELEASE



Comment: FINAL INSPECTION/W/O RELEASE

07/01/24

Job Completion



07/01/23

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Mfg / Design Mgr	Approval QC Inspector

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Design Mgr	Approval QC Inspector
			Initial Design Mgr	Action Description Design Mgr	Sign & Date			

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

NOTE: Date & initial all entries

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

<b>DART AEROSPACE LTD</b>		<b>Work Order:</b>	30146
<b>Description: Bar</b>		<b>Part Number:</b>	D3196-1
<b>Inspection Dwg: D3196</b>		<b>Rev: B C</b>	<b>Page 1 of 1</b>

### FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article ☐ Prototype

Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
26.094	+/-0.010	26.094	—		Tape Measure	
4.083 4.045	+/-0.010	4.046	—			
17.928 18.003	+/-0.005	18.003	—			
0.750	+/-0.005	0.750	—			Mat. thickness
1.500	+/-0.010	1.500	—			Mat. Dim
Ø0.344	+0.006/-0.001	0.345	—			
Ø0.660 x 100°	+0.008/-0.001 x 0.5°	0.663 x 100°	—			
0.060 x 45°	+/-0.010 x 0.5°	0.060 x 45°	—			
0.750	+/-0.010	0.749	—			
0.250	+/-0.010	0.250	—			
1.083 3.495	+/-0.010	3.496	—			
9.000	+/-0.010	9.000	—			
16.844	+/-0.010	16.844	—		Tape Measure	
1.245 21.498	+/-0.010	21.498	—			
R0.125	+/-0.010	0.125	—			
1.000 1.100	+/-0.010	1.100	—			
R0.125	+/-0.010	0.125	—			

<b>Measured by:</b>	EP	<b>Audited by:</b>	SA	<b>Prototype Approval:</b>	N/A
<b>Date:</b>	07/01/18	<b>Date:</b>	07/01/17	<b>Date:</b>	N/A

Rev	Date	Change	Revised by	Approved
A	04.04.20	New Issue	KJ/RF	
B	06.10.24	Dwg Rev. updated	KJ/JLM	EP

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Mfg / Design Mgr	Approval QC Inspector

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Design Mgr	Approval QC Inspector
			Initial Design Mgr	Action Description Design Mgr	Sign & Date			

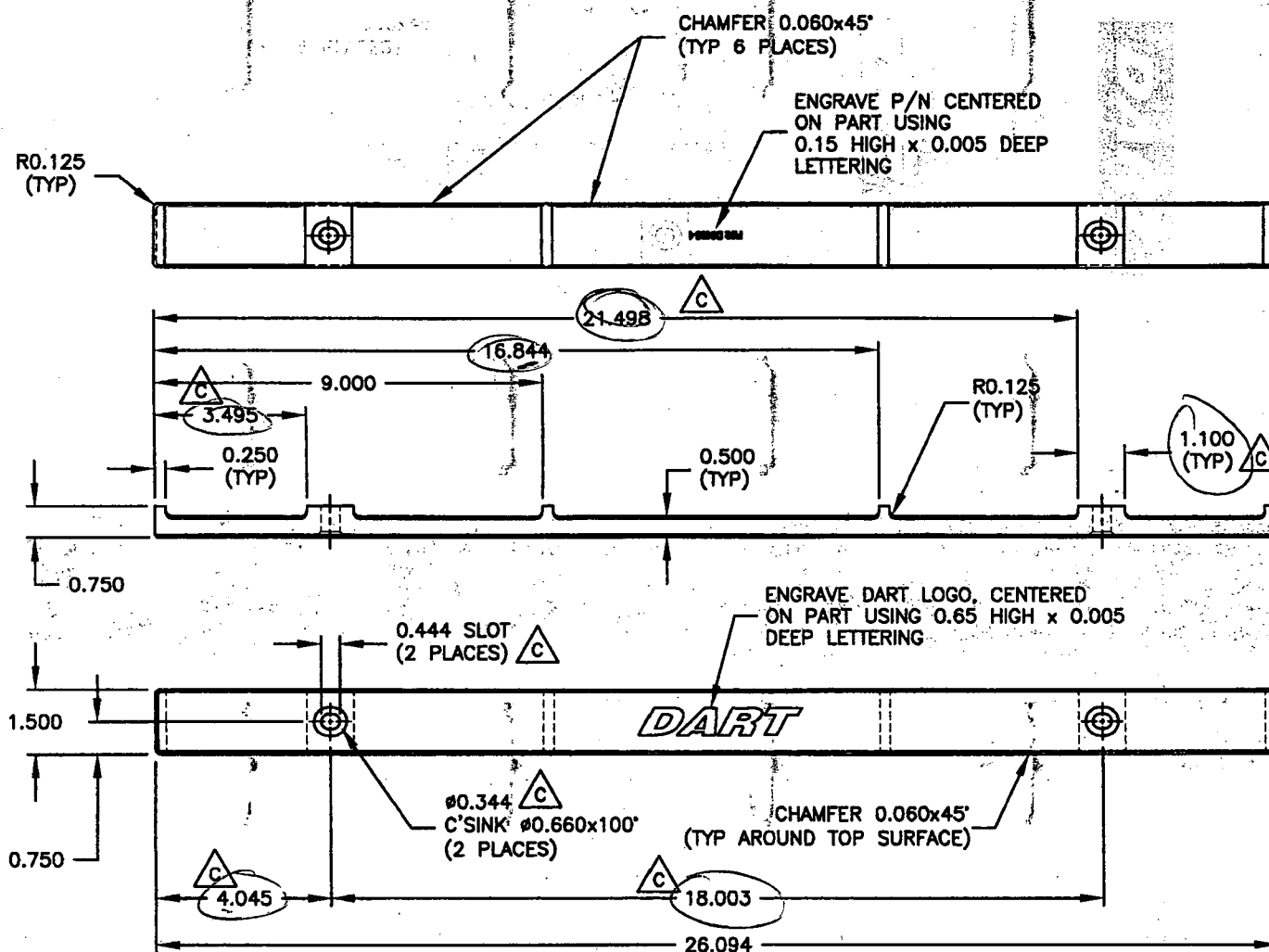
Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

NOTE: Date & initial all entries

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

**DART AEROSPACE LTD**  
HAWKESBURY, ONTARIO, CANADA

de. 10. 31



**D3186-1 BAR**

- 1) MATERIAL: 6061-T6/T651 ALUMINUM (QQ-A-200/8 OR QQ-A-225/8)  
(REF DART SPEC. M6061T6B)
- 2) BREAK ALL SHARP EDGES 0.005 TO 0.010
- 3) FINISH: ACID ETCH AND ALODINE PER DART QSI 005 4.1  
POWDER COAT GREY SANDTEX (4.3.5.6) PER DART QSI 005 4.3
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED
- ALL DIMENSIONS ARE IN INCHES

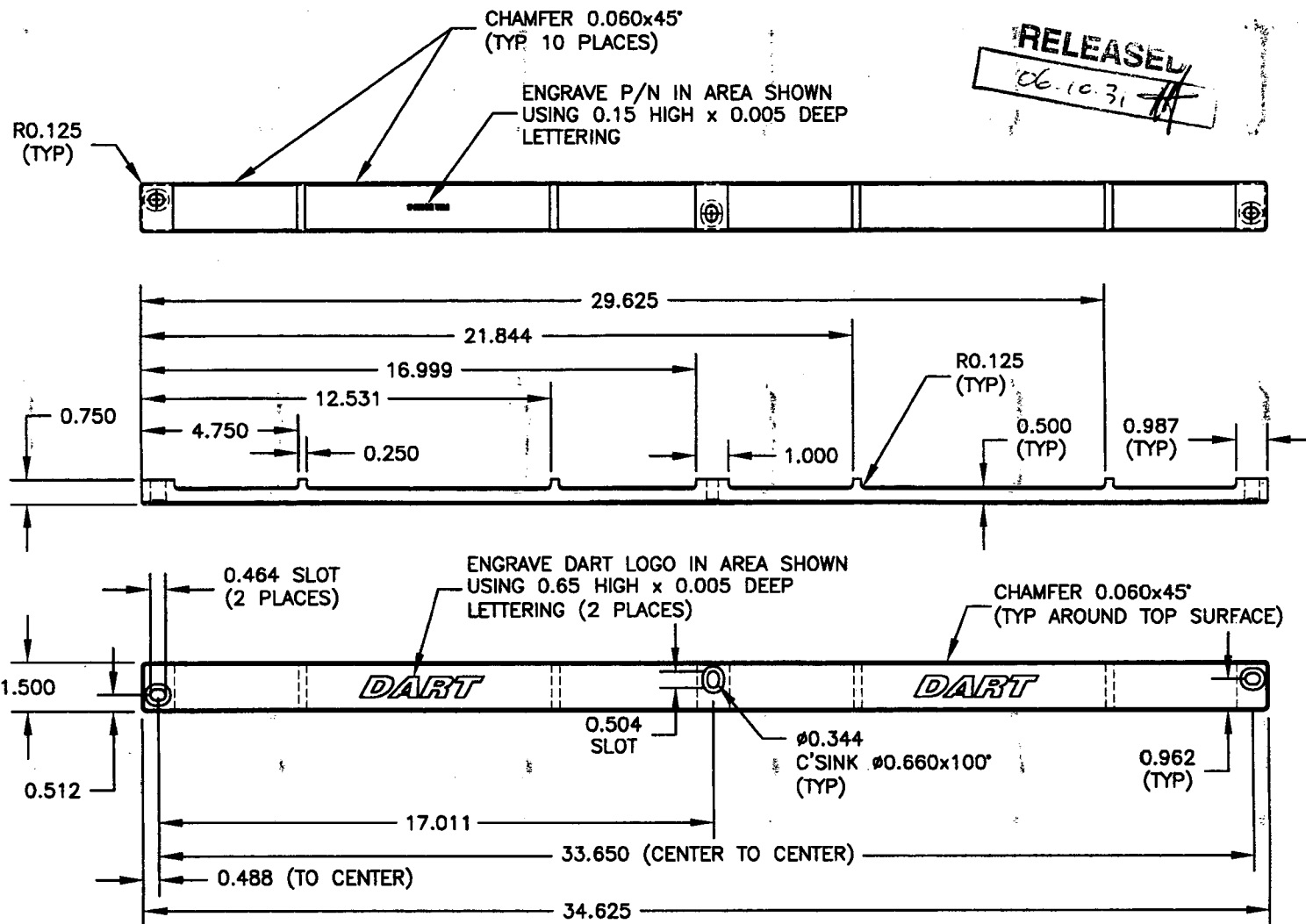
DESIGN	UPDOWN BT	DART AEROSPACE LTD HAMKESBURY, ONTARIO, CANADA		REV. C
CHECKED	APPROVED	DRAWING NO.	SHEET 1 OF 3	
PH	PH	D3196	SCALE	
DATE		TITLE	1:4	
06.10.31		BAR		
A	03.06.25	NEW ISSUE		
B	06.09.25	ADD D3196-5		
C	06.10.31	ADD SLOTS ON -1; REMOVED -5		

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**DART**

RELEASED  
06.10.31



**D3196-3 BAR**

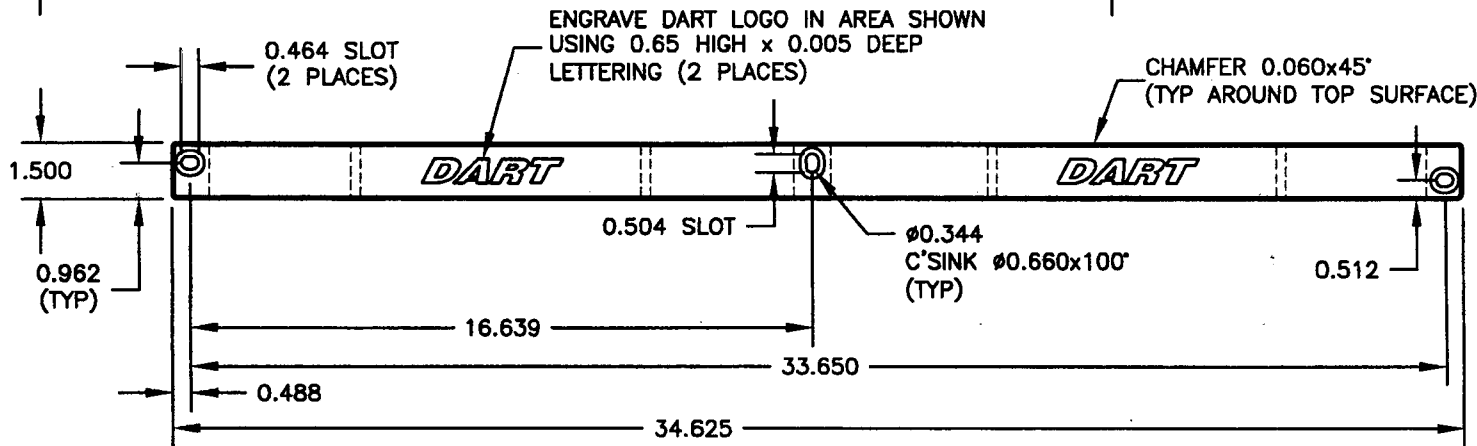
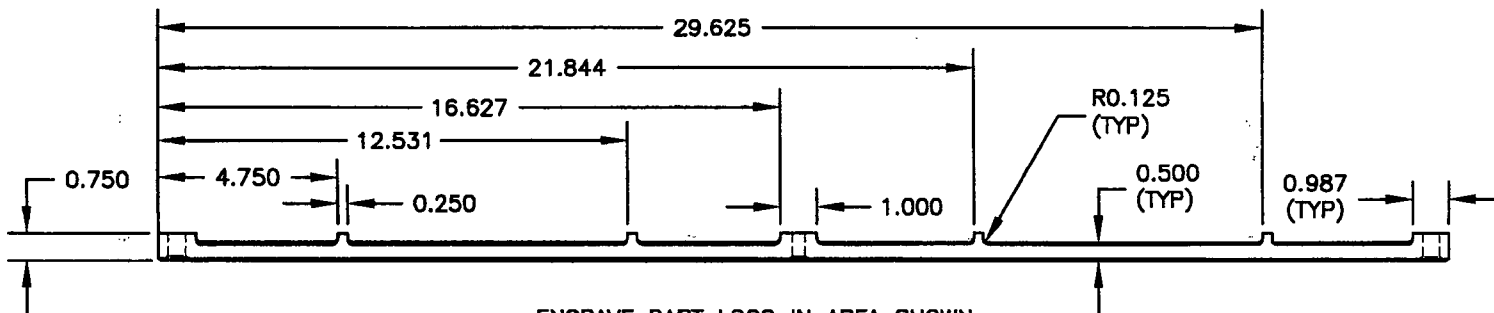
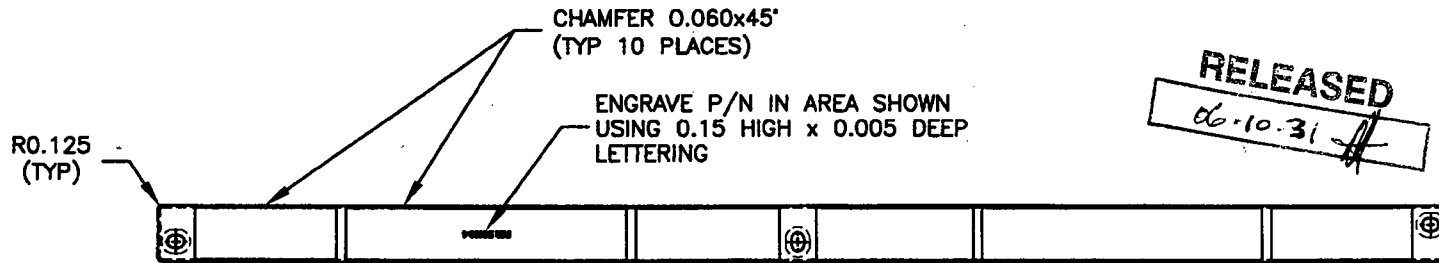
- 1) MATERIAL: 6061-T6/T651 ALUMINUM (QQ-A-200/8 OR QQ-A-225/8)  
(REF DART SPEC. M6061T6B)
- 2) BREAK ALL SHARP EDGES 0.005 TO 0.010
- 3) FINISH: ACID ETCH AND ALODINE PER DART QSI 005 4.1  
POWDER COAT GREY SANDTEX (4.3.5.6) PER DART QSI 005 4.3
- 4) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED
- 5) ALL DIMENSIONS ARE IN INCHES

DESIGN	Q	DRAWN BY	J	DART AEROSPACE LTD.
CHECKED	M	APPROVED	M	HAWKESBURY, ONTARIO, CANADA
DATE	06.10.31	TITLE	BAR	REV. C
		DRAWING NO.	D3196	SHEET 2 OF 3
		SCALE	1:5	





RELEASED  
06-10-31



### D3196-4 BAR

- 1) MATERIAL: 6061-T6/T651 ALUMINUM (QQ-A-200/8 OR QQ-A-225/8)  
(REF DART SPEC. M6061T6B)
- 2) BREAK ALL SHARP EDGES 0.005 TO 0.010
- 3) FINISH: ACID ETCH AND ALODINE PER DART QSI 005 4.1  
POWDER COAT GREY SANDTEX (4.3.5.6) PER DART QSI 005 4.3
- 4) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED
- 5) ALL DIMENSIONS ARE IN INCHES

DESIGN	Q	DRAWN BY	J	DART AEROSPACE LTD
CHECKED	PH	APPROVED		HAWKESBURY, ONTARIO, CANADA
DATE	06.10.31	DRAWING NO.	D3196	REV. C
TITLE	BAR	SHEET 3 OF 3		SCALE
				1:5

4.0 Analysis4.1 D3196-1/-3/-4 Bar Analysis4.1.1 D3196-1 Bar Bending Failure

The loading of the D3196-1 Bar is shown in Figure 1 of Appendix B. The worst case loading is the 16 g forward acting load because the magnitude of the load is higher and the section is smaller in the fwd-aft direction (16g) than it is in the up-down direction (4g).

$$b := 1.50 \cdot \text{in}$$

$$t := 0.50 \cdot \text{in}$$

$$k := 1.5$$

$$M := 2048 \cdot \text{in} \cdot \text{lb}$$

$$I := \frac{1}{12} \cdot b \cdot t^3$$

$$F_{bul} := F_{tul} + F_{ol} \cdot (k - 1)$$

$$M_u := F_{bul} \cdot \frac{2 \cdot I}{t}$$

$$MS := \frac{M_u}{M} - 1$$

$$M = 2048 \cdot \text{in} \cdot \text{lb}$$

$$I = 0.01563 \cdot \text{in}^4$$

$$F_{bul} = 48911 \cdot \text{psi}$$

$$M_u = 3057 \cdot \text{in} \cdot \text{lb}$$

$$MS = 0.49$$

Width of Section in Bending

Thickness of Section in Bending

Shape Factor (Bruhn C3.3)

Maximum Ultimate Bending Moment

Inertia of cross section

Modulus of Rupture (Bruhn C3.11)

Allowable Bending Moment (Ultimate)

Margin of Safety (Ultimate)

width of  
pad has  
no effect  
on MS

P 07-4-19

4.1.2 D3196-3/-4 Bar Bending Failure

The loading of the D3196-3/-4 Bar is shown in Figure 2 of Appendix B. The worst case loading is the 8g sideways acting load because the magnitude of the load is higher and the section is smaller in the lateral direction (8g) than it is in the up-down direction (4g).

$$b := 1.50 \cdot \text{in}$$

$$t := 0.375 \cdot \text{in}$$

$$k := 1.5$$

$$M := 1180 \cdot \text{in} \cdot \text{lb}$$

$$I := \frac{1}{12} \cdot b \cdot t^3$$

$$F_{bul} := F_{tul} + F_{ol} \cdot (k - 1)$$

$$M_u := F_{bul} \cdot \frac{2 \cdot I}{t}$$

$$MS := \frac{M_u}{M} - 1$$

$$M = 1180 \cdot \text{in} \cdot \text{lb}$$

$$I = 0.00659 \cdot \text{in}^4$$

$$F_{bul} = 48911 \cdot \text{psi}$$

$$M_u = 1720 \cdot \text{in} \cdot \text{lb}$$

$$MS = 0.46$$

Width of Section in Bending

Thickness of Section in Bending

Shape Factor (Bruhn C3.3)

Maximum Ultimate Bending Moment

Inertia of cross section

Modulus of Rupture (Bruhn C3.11)

Allowable Bending Moment (Ultimate)

Margin of Safety (Ultimate)